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FLOOD INSURANCE STUDY

VILLAGE OF DEERFIELD, ILLINOIS

LAKE AND COOK COUNTIES

REVISED:

AUGUST 4, 1988

Federal Emergency Management Agency

COMMUNITY NUMBER - 170361

COMPLETED

ORIGINAL

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

This publication incorporates revisions to the original Flood Insurance Study. These revisions are presented in Section 9.0.

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PUBLISHED SEPARATELY:

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1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the Village of Deerfield, Lake and Cook Counties, Illinois, and to aid in the administration of the Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to convert the Village of Deerfield to the regular program of flood insurance by the Federal Insurance Administration. Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain development.

1.2 Coordination

The City of Highland Park furnished seven valley cross sections along the Middle Fork North Branch Chicago River.

A final community coordination meeting to discuss the study was held March 31, 1976.

1.3 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydaulic analyses for this study were performed by the Soil Conservation Service, U.S. Department of Agriculture, for the Federal Insurance Administration, under Inter-Agency Agreement No. IAA-H-4-73, Project Order No. 11. This work, which was completed in December 1973, covered all flooding sources affecting the Village of Deerfield.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated areas of the Village of Deerfield, located in Lake and Cook Counties, Illinois. The area of study is shown on the Vicinity Map (Figure 1).

The Middle Fork North Branch Chicago River drains through the east side of the village. The West Fork North Branch

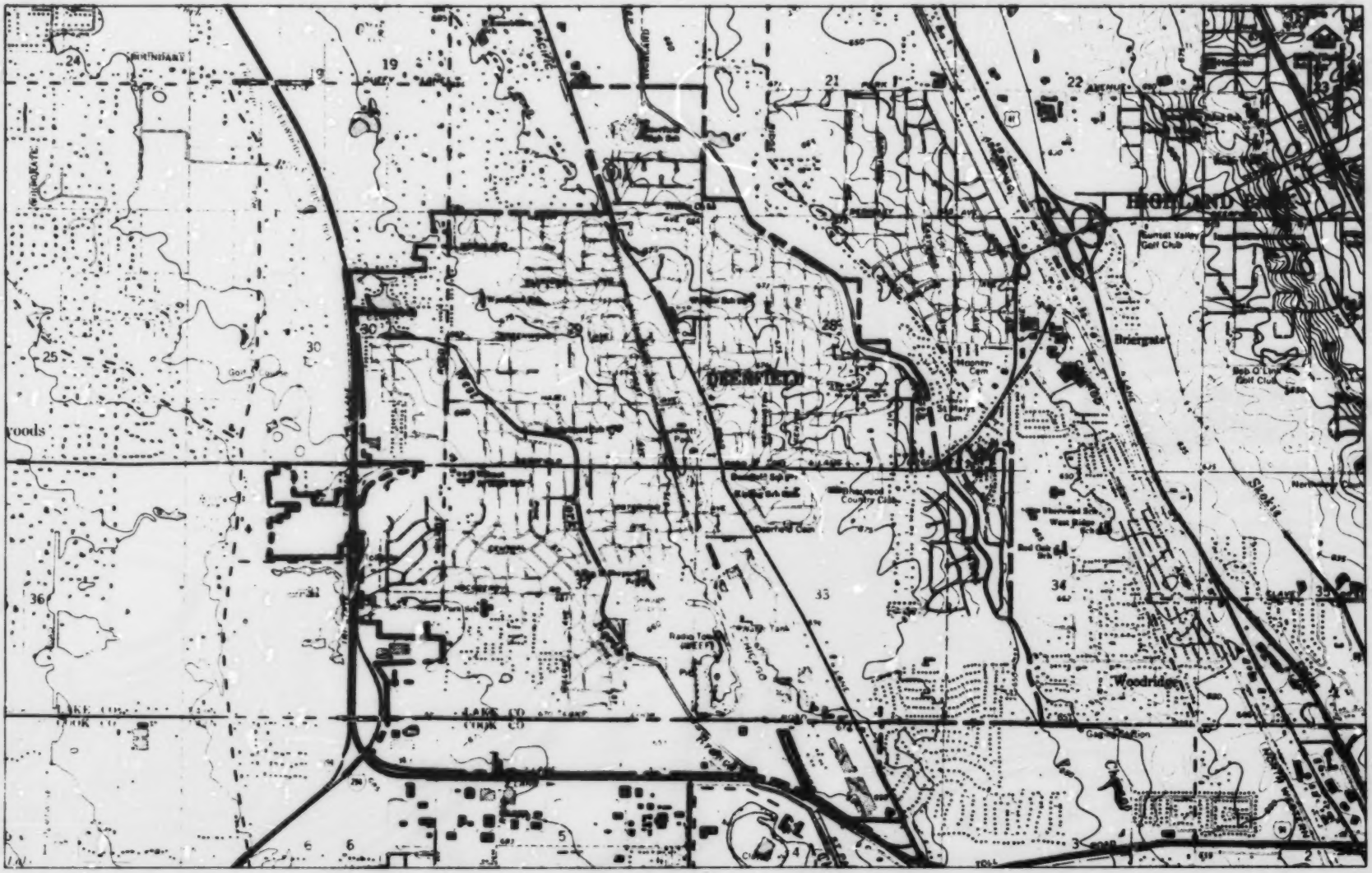

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF DEERFIELD, IL

(LAKE AND COOK COS.)

APPROXIMATE SCALE

3100 0 3100 6200 9300 FEET

VICINITY MAP

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Chicago River bisects the western half of the village, flowing from the northwestern corner in a generally southeastern direction. The Middle Fork and the West Fork were studied in detail.

2.2 Community Description

The Village of Deerfield is located in Lake and Cook Counties. The counties are located in northeastern Illinois in the Chicago metropolitan area. In 1970, the population of the village was 18,949 and has experienced only a slight growth since.

The village covers 4.66 square miles, with 4.45 square miles in Lake County and 0.19 square miles in Cook County. Village elevations range from 650 feet to 695 feet.

The topography of the village has been significantly affected by periods of glaciation. Two low glacial moraines bisect the village from north to south. The sags between the moraines form the valleys in which the rivers now flow. With the exception of the major rivers, the drainage pattern is poorly integrated, being composed of small depressions due to an absence of well-developed stream-cut valleys.

Average monthly temperatures range from 17.6°F in January to 65.6°F in July, with an average annual temperature of 42.3°F. The average annual precipitation for the village is 32 inches, and the average annual snowfall is 30 inches.

The flood plains are broad and flat with relatively small channels. Significant flood plain encroachment has occurred in the village.

2.3 Principal Flood Problems

Flooding in Deerfield occurs as a result of overbank flows from intense local thunderstorms, which occur mostly in the summer. Flash floods may occur at any time, however, since most watercourses in the village are small streams.

Large magnitude floods have occurred on the North Branch Chicago River several times. Since 1951, it has left its bank 44 times, an average of more than two floods a year. The highest flood on the West Fork North Branch was that of July 1938. Floods occur on the West Fork at the same time as floods on the Middle Fork.

2.4 Flood Protection Measures

There are no known flood protection measures currently operating within the Village of Deerfield, and it is not known whether any such measures are in the planning stage for the immediate future.

3.0 ENGINEERING METHODS

For streams studied in detail in the Village of Deerfield, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Floods having recurrence intervals of 10-, 50-, 100-, and 500-years have been selected as having special significance for the land use and flood insurance applications of the Flood Insurance Program. The analyses reported here reflect current conditions in the watersheds of the streams.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each stream studied in detail in the village.

Flood-frequency data for the area were developed from regional analyses of local stream gage records. A unit hydrograph was previously established for the entire Middle Fork North Branch Chicago River Watershed. It was determined that the stream gage on the West Fork, located in Northbrook, best represented watershed conditions. Flood routing was done with the Soil Conservation Service TR-20 Project Formulation computer program (Reference 1). This established discharge-frequency relations along the Middle Fork North Branch Chicago River and the West Fork North Branch Chicago River. The hydrologic data used came from a previously published report (Reference 2).

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of streams in the community are carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each stream studied in detail.

Water-surface elevations of floods of the selected recurrence intervals were computed through use of the Soil Conservation Service Water-Surface Profile Program (Reference 3), starting at the stream gage on the West

Fork, located in Northbrook. Cross sections for the backwater analyses of the streams were field-surveyed and were located at close intervals above and below bridges in order to compute the significant backwater effects of these structures. Locations of selected cross sections are shown on the Flood Profiles (Exhibit 1).

Channel roughness factors (Manning's "n") for these computations were assigned on the basis of field inspection of flood plain areas. U. S. Geological Survey Water Supply Paper 1849, the Soil Conservation Service Guide for Selecting Roughness Coefficients, and U. S. Geological Survey rating measurements were used as guides.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1). All elevations are measured from mean sea level datum.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

A prime purpose of the National Flood Insurance Program is to encourage state and local governments to adopt sound flood plain management programs. Each Flood Insurance Study, therefore, includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the Federal Insurance Administration as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100-year and the 500-year flood have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps developed from low-level aerial photographs enlarged to a scale of 1:4800, with a contour interval of 2 feet.

Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity and increases flood heights, thus increasing flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood be carried without substantial increases in flood heights. Criteria adopted by the Federal Insurance Administration limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. However, the State of Illinois has adopted stricter floodway regulations which limit increases in flood heights to 0.1 foot. Although the floodway shown in this Flood Insurance Study does not conform completely with the state criteria, it has been accepted by the State of Illinois.

The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodway prepared for this study was computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations are tabulated at selected cross sections for each stream studied in detail (Table 1). As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were determined at cross sections; between cross sections the boundaries were interpolated.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than one foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	STATION[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (M.S.L.)	WITHOUT FLOODWAY (M.S.L.)	DIFFERENCE (FT.)
MIDDLE FORK NORTH BRANCH CHICAGO RIVER							
A	33,880	229[2]	694	1.57	650.8	650.7	0.1
B	34,800	209[2]	475	2.27	651.4	651.2	0.2
C	37,700	67	421	2.51	652.9	652.7	0.2
D	41,850	114[2]	621	1.66	655.2	654.9	0.3
E	43,520	90	383	2.68	656.1	655.8	0.3
F	47,030	57	344	2.93	656.9	656.8	0.1
G	49,700	237	878	1.15	657.4	657.2	0.2
WEST FORK NORTH BRANCH CHICAGO RIVER							
A	46,520	220	783	1.72	653.0	652.8	0.2
B	50,300	150	378	2.97	654.6	654.5	0.1
C	51,880	184	701	1.60	655.8	655.7	0.1
D	53,000	172	603	1.79	656.5	656.2	0.3
E	53,860	150	593	1.82	657.7	657.2	0.5
F	56,300	205	944	1.06	660.1	659.8	0.3
G	57,920	91	370	2.54	661.1	660.8	0.3
H	60,950	42[2]	248	3.74	664.5	664.4	0.1

[1]FEET ABOVE MOUTH [2]PART OF FLOODWAY LOCATED OUTSIDE CORPORATE LIMITS

TABLE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF DEERFIELD, IL
(LAKE AND COOK COS.)

FLOODWAY DATA

MIDDLE FORK NORTH BRANCH CHICAGO RIVER
WEST FORK NORTH BRANCH CHICAGO RIVER

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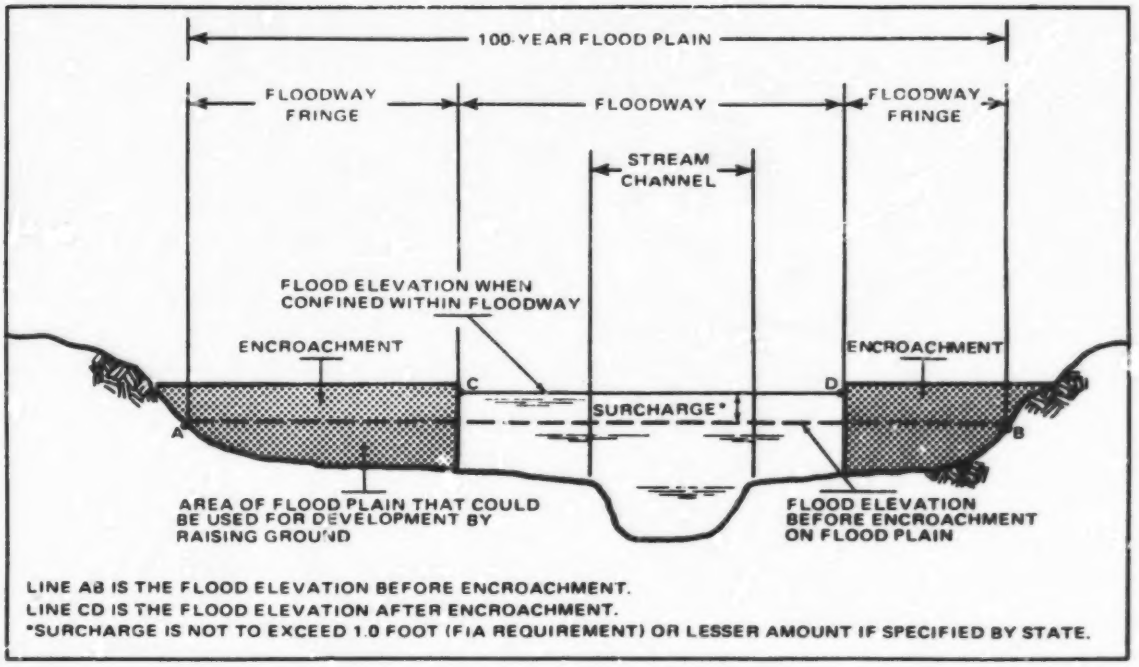
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

Figure 2. Floodway Schematic

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the Federal Insurance Administration has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source affecting the Village of Deerfield.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-year Floods	Variation
Less than 2 feet	0.5 foot

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Two reaches meeting the above criterion were required to establish flood insurance zones for the Village of Deerfield; one for the West Fork and one for the Middle Fork. The locations of the reaches are shown on the Flood Profiles (Exhibit 1).

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is the Federal Insurance Administration device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHF are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10-year and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10-year and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective Flood Hazard Factors, the entire Village of Deerfield was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zones A2, A3:	Special Flood Hazard Areas inundated by the 100-year flood, with base flood elevations determined and zone designations assigned according to the Flood Hazard Factor.
Zone B:	Area between Zones A2, A3, and the limits of the 500-year flood.
Zone C:	Area not subject to flooding by the 500-year flood.

Table 2, "Flood Insurance Zone Data," summarizes the flood elevation differences, Flood Hazard Factors, flood insurance zones, and base flood elevations for each flooding source in the community studied in detail.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3]
		10% (10-YR)	2% (50-YR)	0.2% (500-YR)			
MIDDLE FORK NORTH BRANCH CHICAGO RIVER REACH 1	02, 04, 05, 08, 11	0.94	0.35	0.43	010	A2	VARIES - SEE MAP
WEST FORK MIDDLE BRANCH CHICAGO RIVER REACH 1	03, 04, 06, 07, 10, 11, 12	1.38	0.31	0.47	015	A3	VARIES - SEE MAP

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF DEERFIELD, IL
(LAKE AND COOK COS.)

FLOOD INSURANCE ZONE DATA

MIDDLE FORK NORTH BRANCH CHICAGO RIVER,
WEST FORK MIDDLE BRANCH CHICAGO RIVER

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5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Village of Deerfield is, for insurance purposes, the principal result of the Flood Insurance Study. This is the official map (published separately), on which the Federal Insurance Administration has delineated the flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the Federal Insurance Administration.

6.0 OTHER STUDIES

A Flood Plain Information Report for North Branch Chicago River, West Fork and Skokie Rivers, was prepared by the U. S. Army Corps of Engineers. In it, the elevations of the Intermediate Regional Flood (100-year) are about 3 feet lower at some locations than in this study. The elevations and discharges in the Flood Insurance Study have been adopted by the State of Illinois, Water Resources Division, and as such they supersede those in the Flood Plain Information Report.

This study is authoritative for purposes of the Flood Insurance Program.

7.0 LOCATION OF DATA

The survey, hydraulic, hydrologic, and other pertinent back-up data and computations for this study are on file with the Soil Conservation Service, U. S. Department of Agriculture, 200 West Church Street, Champaign, Illinois 61820.

8.0 BIBLIOGRAPHY AND REFERENCES

1. U. S. Department of Agriculture, Soil Conservation Service, Engineering Division, Technical Release No. 20, Supplement No. 1, Central Technical Unit, March 1969

2. ----------, Chicago Metropolitan River Basin Study for the North Branch of the Chicago River, Implementation Plan, October 1974

3. ----------, Soil Conservation Service, Engineering Division, WSP-II, March 1974

4. U. S. Army Corps of Engineers, Chicago District, Flood Plain Information Report on the North Branch Chicago River, West Fork and Skokie Rivers, Cook and Lake Counties, Illinois, July 1970

5. U. S. Geological Survey, Highland Park, Illinois, 7.5-Minute Series Quadrangle, 1963, photorevised 1972

9.0 REVISIONS DESCRIPTION

This section has been added to provide information regarding significant revisions made since the original Flood Insurance Study was printed. Future revisions may be made that do not result in the republishing of the Flood Insurance Study report. To assure that any user is aware of all revisions, it is advisable to contact the community repository of flood hazard data located at Village Hall, 850 Waukegan Road, Deerfield, Illinois.

9.1 First Revision (Revised August 4, 1988)

a. Acknowledgments

The hydrologic and hydraulic analyses for this Revisions Description were obtained from the City of Deerfield, Lake and Cook Counties, Illinois. The Federal Emergency Management Agency (FEMA) reviewed and accepted these data for purposes of this revision.

b. Scope

Detailed flooding information was added for the West Fork North Branch Chicago River due to annexation of a rhombus shaped area just upstream of Lake-Cook Road.

c. Hydrologic and Hydraulic Analyses

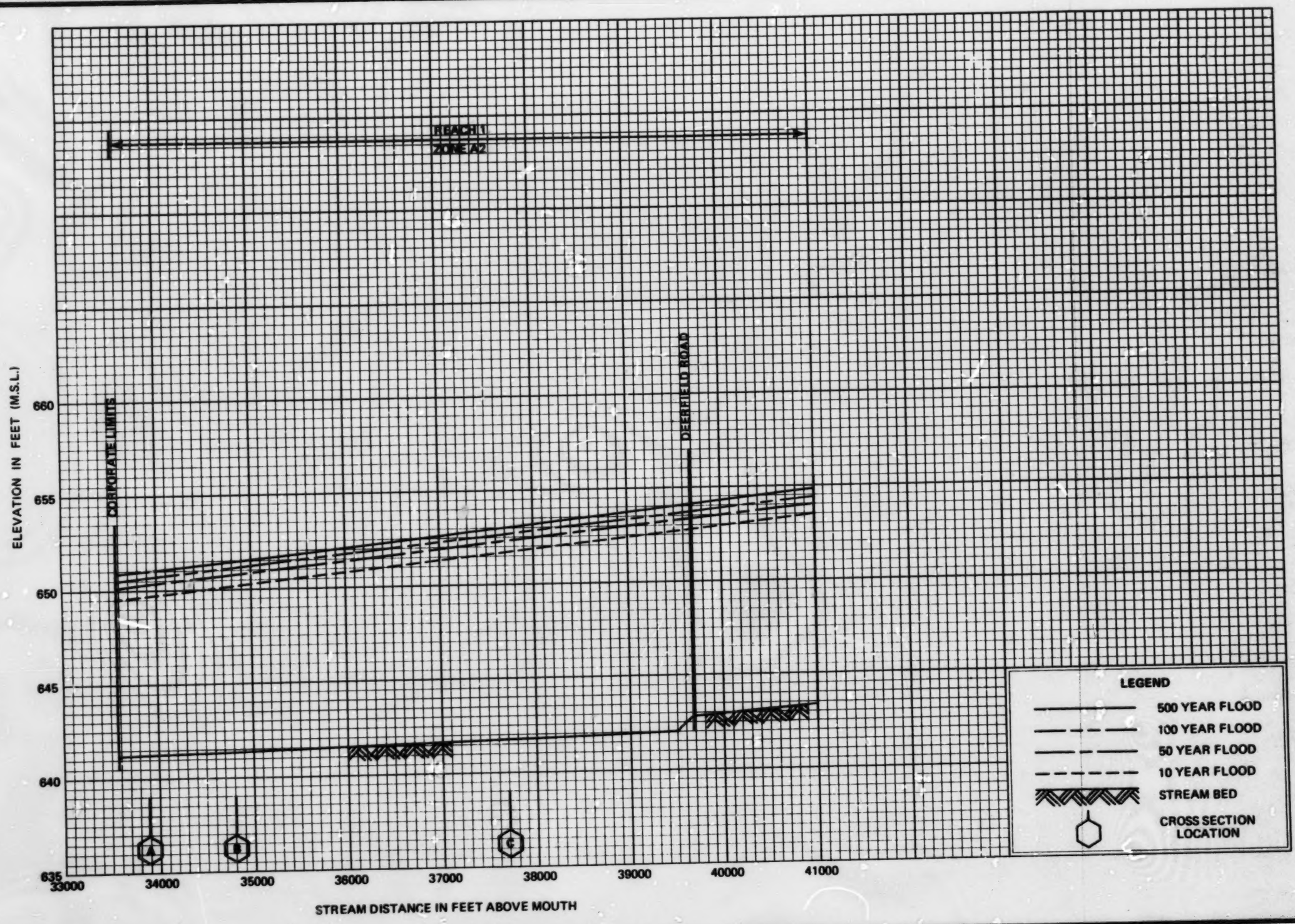
Data from the original hydrologic and hydraulic analyses, which were used in preparing the previously effective Flood Insurance Study for Deerfield, Illinois, were used in determining the special flood hazard areas and flood insurance zone designations

d. Floodways

The floodway for the annexed area along the West Fork North Branch Chicago River was delineated using topographic maps at a scale of 1:24000 with a contour interval of 5 feet (Reference 1) and engineering judgment.

e. References and Bibliography

1. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 5 feet: Highland Park, Illinois, 1963, photorevised 1972.



FLOOD PROFILES

MIDDLE FORK NORTH BRANCH CHICAGO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF DEERFIELD, IL
(LAKE AND COOK COS.)

01P

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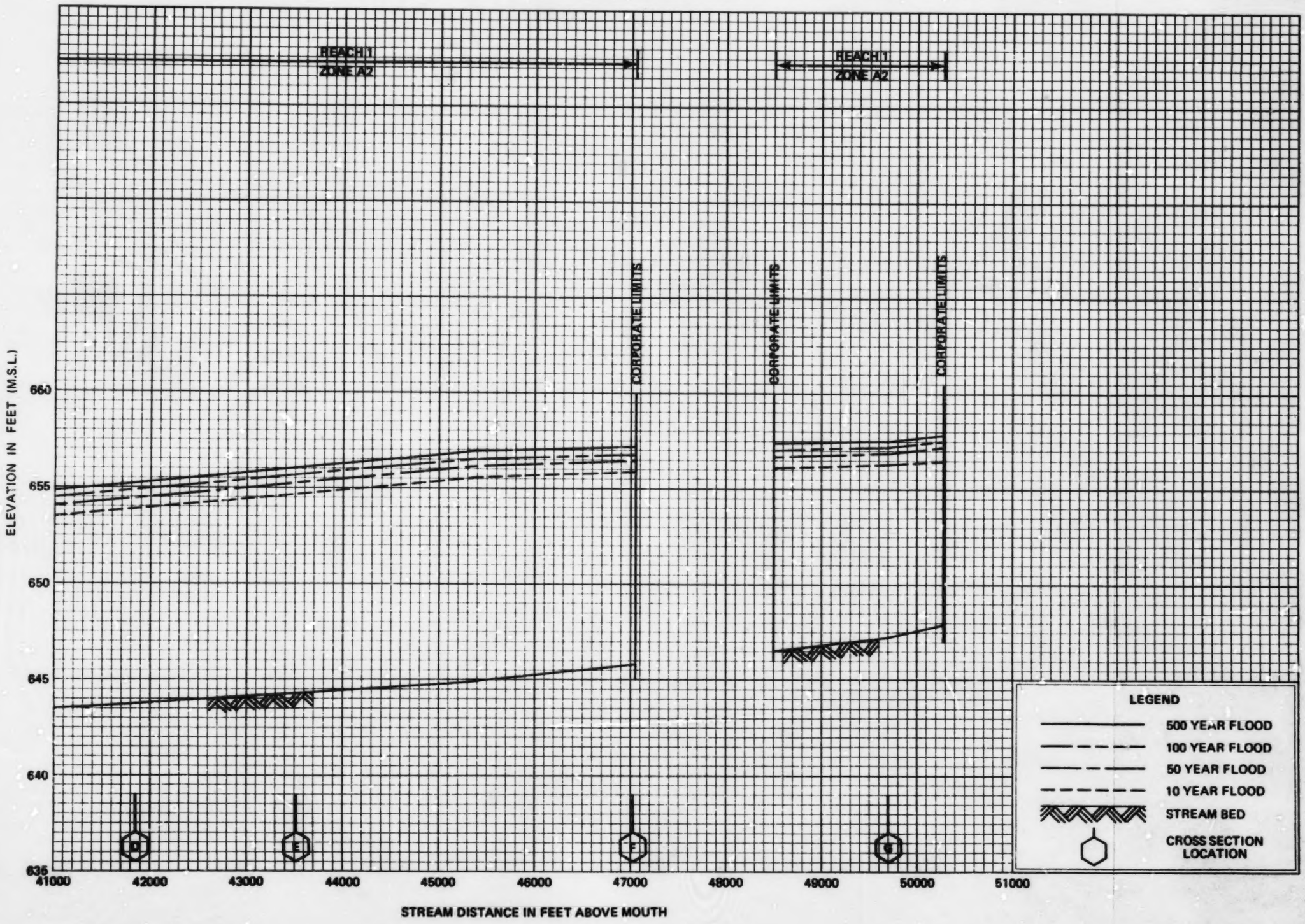

FLOOD PROFILES

MIDDLE FORK NORTH BRANCH CHICAGO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF DEERFIELD, IL

(LAKE AND COOK COS.)

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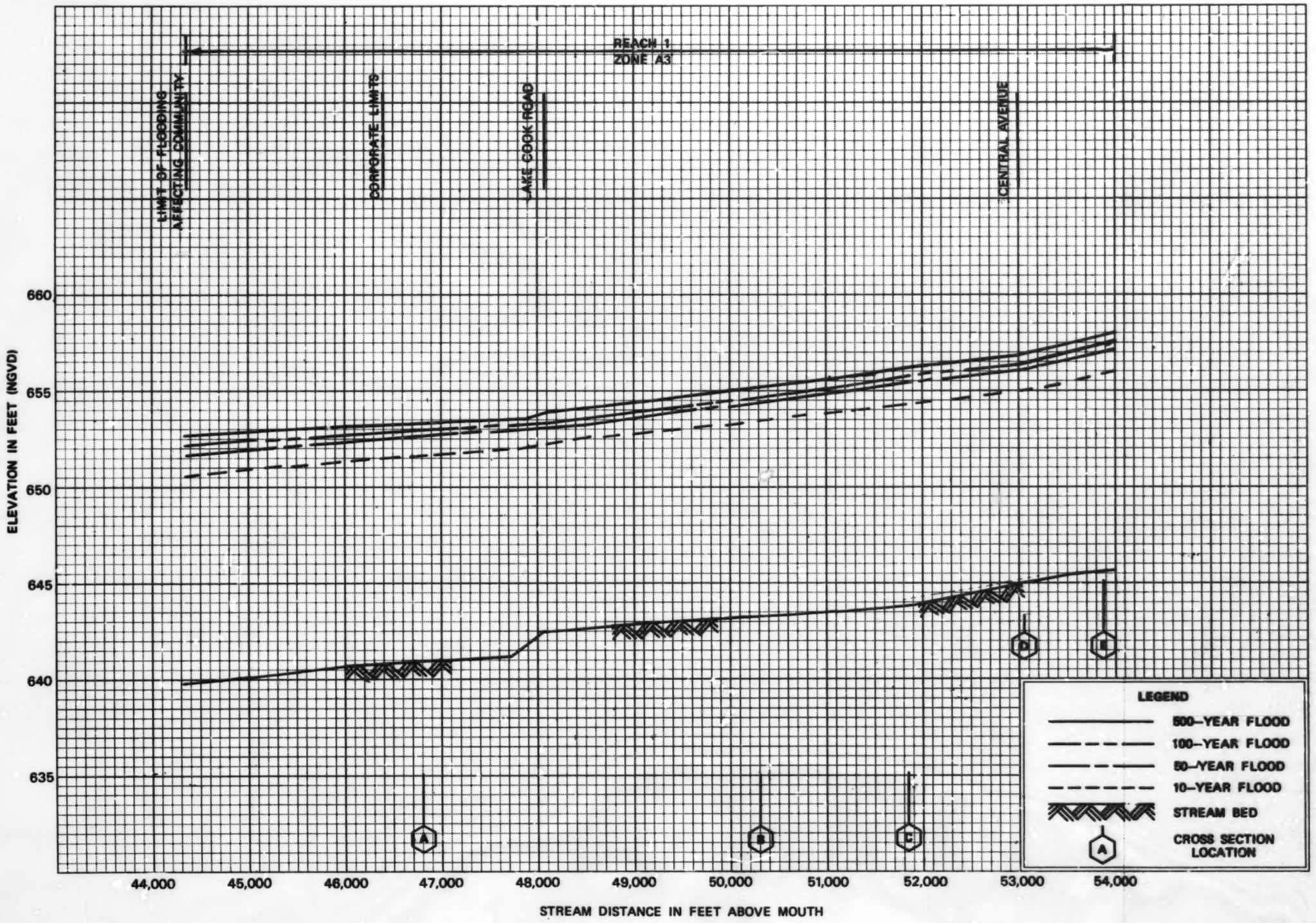

FLOOD PROFILES

WEST FORK NORTH BRANCH CHICAGO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF DEERFIELD, IL
(LAKE AND COOK COS.)

03P

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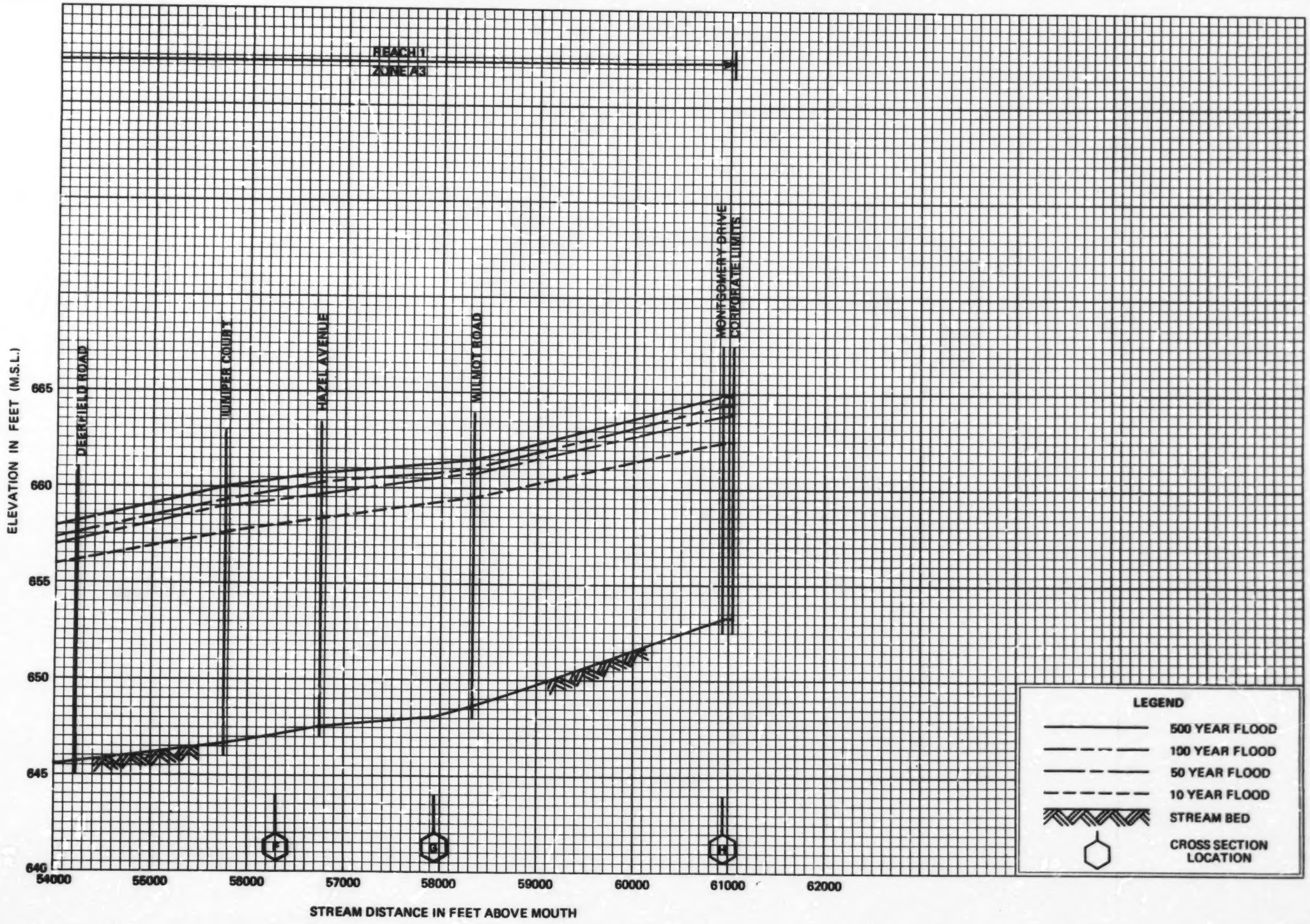

FLOOD PROFILES

WEST FORK NORTH BRANCH CHICAGO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF DEERFIELD, IL
(LAKE AND COOK COS.)

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